Case Report

Treatment of lethal acetylsalicylic acid poisoning without hemodialysis

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Case: A woman aged in her 20s ingested approximately 99 g acetylsalicylic acid, and was transported to our hospital 2 h later. She was lucid, but complained of hearing loss and tinnitus. We performed gastric lavage and gave her activated charcoal several times. We attempted to maintain the urinary pH at 7.5 and output above 100 mL/h while preparing for urgent hemodialysis.

Outcome: It was revealed after discharge that the blood concentration of acetylsalicylic acid was 103.8 mg/dL on admission (lethal dose level) and had decreased to 35.4 mg/dL by the next morning. The half-life was 8.5 h.

Conclusion: Hemodialysis is strongly recommended for patients who take a lethal dose of acetylsalicylic acid. However, by carefully evaluating the vital signs and urinary output and pH, while preparing for emergency hemodialysis, we consider that it is possible to treat acetylsalicylic acid poisoning by alkaline diuresis and critical supportive care.

Key words: Alkalinization, half-life, salicylate, urinary output, urinary pH

INTRODUCTION

ACETYLSALICYLIC ACID IS a component of many prescriptions and over-the-counter medications, commonly used for its anti-inflammatory and analgesic properties. Although the overall mortality rate due to acetylsalicylic acid poisoning is low, it is potentially fatal.[1,2] Severe acetylsalicylic acid poisoning may cause metabolic acidosis, convulsions, coma, hyperpyrexia, pulmonary edema, and renal failure.[3] Rapid alkalinization by sodium bicarbonate is useful for decreasing the amount of acetylsalicylic acid crossing the blood–brain barrier and increasing renal clearance.[4] However, if the plasma acetylsalicylic acid concentration is higher than 100 mg/dL, hemodialysis should be considered with or without clinical findings.[5] We encountered a severe acetylsalicylic acid poisoning patient whose plasma concentration of acetylsalicylic acid was higher than 100 mg/dL. We report the successful treatment of the patient without hemodialysis, by alkaline diuresis and critical supportive care, and confirmation of the increased renal clearance of acetylsalicylic acid by carefully evaluating vital signs and urinary output and pH, while preparing for emergency hemodialysis.

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CASE REPORT

A WOMAN AGED IN her 20s with a history of depression took 300 tablets of acetylsalicylic acid (total content, approximately 99 g) and 20 tablets of dihydropyridine (total content, approximately 100 mg). She was transported to our hospital by ambulance 2 h after ingestion. She was initially lucid, with a respiratory rate of 20 breaths/min, heart rate of 120 b.p.m., blood pressure of 120/65 mmHg, body temperature of 37.0°C, body weight of 45 kg, and oxygen saturation of 100% on receiving O_2 at 6 L/min. She had nausea, vomiting, tinnitus, and hypoacusis. Her initial arterial blood gas showed a pH of 7.481, pCO_2 of 25.9 mmHg, pO_2 of 215 mmHg, and bicarbonate of 19.5 mmol/L. Her initial blood examination and chest X-ray were unremarkable.

She underwent tracheal intubation to prevent aspiration before gastric lavage was carried out. She was initially given activated charcoal and laxative agents through a nasogastric tube and was started on i.v. $NaHCO_3$ (250 mg) and calcium

gluconate (3 g). We gave her activated charcoal several times after admission. We couldn't measure the serum acetylsalicylic acid level at our hospital, so this was undertaken by another institution.

The patient was diagnosed with moderate acetylsalicylic acid toxicity based on physical and neurological findings. Initially, she was treated by urinary alkalinization and preservation of the urinary output. We prepared for hemodialysis so that it could be initiated when needed. We managed to achieve a urinary output >1 mL/kg/h and urinary pH >7.5. If these numbers could not be achieved on monitoring every 2 h, we planned to perform hemodialysis. We evaluated the respiratory condition by clinical evaluation and blood gas analysis.

Approximately 40 h after admission, the patient's urinary output was above 1 mL/kg/h and urine pH was maintained above 8.0 (Figure 1). We sampled blood to measure the blood concentration of the drug on admission and after 13 h. She was discharged without complications after a 3-day hospitalization.

The blood concentration of acetylsalicylic acid was 103.8 mg/dL on admission (lethal dose level) and had decreased to 35.4 mg/dL by the next morning. The half-life was approximately 8.5 h. We consider that the shortened half-life was explained by the excretion of acetylsalicylic acid by the urinary alkalinization, and increasing the proportion of free acetylsalicylic acid by saturated blood protein binding.

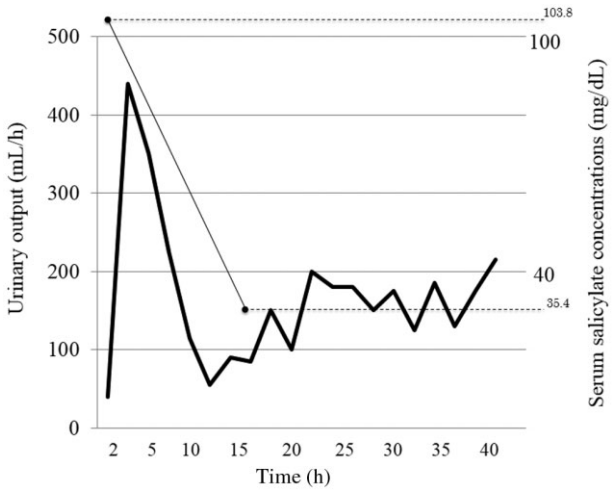

Fig. 1. Clinical course after urinary alkalinization in a woman aged in her 20s who ingested approximately 99 g acetylsalicylic acid. Thick solid line, urinary output; thin line, serum salicylate concentration.

DISCUSSION

WE PRESENT A case of severe acetylsalicylic acid poisoning in which the patient had nausea and vomiting, tinnitus, and hypoacusis. However, her initial physical and neurological findings were not severe. We initially treated her as having moderate acetylsalicylic acid intoxication. Treatment was directed toward inhibiting further absorption, preventing its entry into the central nervous system, and promoting elimination from the body. Activated charcoal and laxative agents were given through a nasogastric tube in order to inhibit further acetylsalicylic acid absorption. Activated charcoal is the most widely used method of gastric decontamination for acetylsalicylic acid intoxication.[6] Carefully managed serum and urinary alkalinization, along with diuresis, with assessment every 2 h, were carried out to eliminate acetylsalicylic acid from her body. However, we prepared for hemodialysis to be implemented if it became impossible to achieve urinary output >1 mL/kg/h and urinary pH >7.5.

In 2004, a position paper prepared by the American Academy of Clinical Toxicology and the European Association of Poison Centres and Clinical Toxicologists stated, "urinary alkalinization should be considered first line treatment for the patients with moderately severe salicylate poisoning that does not require hemodialysis".[5] The elimination of salicylate is increased by urinary alkalinization. Also, alkalinization of the serum with sodium bicarbonate can prevent acetylsalicylic acid from entering the central nervous system.[2]

Hemodialysis is the definitive treatment to prevent and treat acetylsalicylic acid organ injury. Indications for hemodialysis are listed in Table 1.[6] Severe poisoning is classified as a serum acetylsalicylic acid level >75 mg/dL.[4] In the present patient, her electrolyte balance and renal function were normal. Her serum acetylsalicylic acid level on admission was over 100 mg/dL. We should have started hemodialysis according to this indication. However, we could not measure the acetylsalicylic acid level immediately in our hospital.

Table 1. Indications for hemodialysis for salicylate poisoning (O'Malley GF[6])

- Plasma salicylate concentration >100 mg/dL, even without clinical findings
- Central nervous system dysfunction with no explanation
- Pulmonary edema/hypoxia
- Renal failure
- Severe acid–base or electrolyte imbalance with no other explanations

Although hemodialysis has been used successfully for many years in the management of severe acetylsalicylic acid poisoning, no controlled trial comparing its efficacy with that of carefully managed urinary alkalinization and diuresis has been carried out.[4]

Our case illustrates that even patients with severe acetylsalicylic acid poisoning can be treated with rigorous urinary alkalinization, diuresis, and critical supportive care. However, preparation to be able to perform emergent hemodialysis if needed is important.

CONCLUSION

IN CASES OF severe acetylsalicylic acid poisoning, it is recommended to perform hemodialysis. However, no controlled trials have compared the efficacy of hemodialysis with that of urinary alkalinization and diuresis. We present a patient with severe acetylsalicylic acid poisoning who was treated with rigorous urinary alkalinization, diuresis, and critical supportive care without hemodialysis. It may be possible to treat such emergent cases with strict critical care and adequate preparation.

CONFLICT OF INTEREST

NONE.

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